LIEBIG'S

FOOD FOR INFANTS

Remarks made before the Medical Society of the County of Kings.

BY J. S. HAWLEY, A. M., M. D.

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The writer, in offering to the medical profession his preparation of "Liebig's Food for Infants," begs to lay before them succinctly the nature of the preparation, the principles upon which it is compounded, and a few testimonials to its value derived from the works of eminent authorities upon the subject.

Preliminary to this, he desires to present some testimony as to the *extreme importance* to be attached to the *proper feeding of infants* and also to the very *serious* evils attending the *failure* to do so.

"Many a woman is capable of nursing her child, yet while doing so both will half live and half starve. If the infant be helped along with artificial food both will thrive. Further, many a mother raises at her own breast, living it is true, but sickly, bloated, rachitical children, three, four, five times. The next time she will wean the baby when a few months old, and for the first time in that family, there will be a healthy, ruddy, noisy, muscular baby. Both as physicians and humanitarians, we must not forget that society has to mourn a great mortality, perhaps less, than the raising of incompetent individuals, and that the vigor of mankind and the future of the race, lies in the

vigor of its men and women, and these grow out of the babies." (*Infants Food: by A. Jacobi, M. D., page* 23.)

Eustace Smith speaking of the causes of wasting diseases of infants and children, says: "This cause may be unsuitable food, the child being *actually starving from his inability to digest and assimilate the diet with which he is being supplied.*"

"Wasting is not always one of the first signs, and may even be altogether absent if the interference with nutrition is not carried to a high degree. Thus a child may be exceedingly plump, and may even excite admiration by his good condition although at the same time he may be suffering from the insidious commencement of rickets, which, if the causes producing the disease continue unchecked, will shortly assert themselves unmistakably."

"In a child suffering from the results of chronic interference with nutrition, from whatever cause, the *power of resisting new injurious influences is very much impaired.* In such a state he is constantly found to be affected by causes so slight as to pass almost unnoticed, and which, in a healthy child would be completely powerless to do harm."

Many thousand children die yearly in London alone, for the the simple reason they are *fed systematically and persistently upon food which they cannot digest.*" This remark is doubtless true of all large cities in all countries.

"There is a difference between food and nourishment. A child may take large quantities of food into his stomach, and yet from the weakness of his digestive organs, or from the indigestible nature of the food swallowed, may derive no nourishment from it whatever."—(*Eustace Smith on Wasting Diseases of Children.*)

" Unfortunately the farinaceous articles of food which are so often selected on account of their supposed lightness as fit to form the almost exclusive diet of infants belong to the class of substances that are assimilated with difficulty ; so that a large portion of the contents of the stomach in a young child brought up by hand enter into the duodenum in a state wholly unfit to be acted upon by the bile. The intestines become irritated by these undigested matters, and in the effort to get rid of them diarrhea is excited, while, if not speedily expelled, they pass into a state of fermentation, or putrefaction, and thus produce those horribly offensive evacuations which are frequently voided by children in these circumstances." " It would be natural to expect that a child would lose flesh and strength, even if the food given to it were no otherwise objectionable than being difficultly digested. But not only are the sago, arrow root, or gruel with which the child is fed, less easy of digestion than the milk, which is its proper aliment, but they moreover when reduced to their ultimate elements present essential differences by which they are rendered so much the more inapt to nourish the body during the period of most active development and growth."

" You are aware that physiological and chemical research have proved that the food has to answer two distinct purposes in the organism ; the one to furnish materials for the growth of the body, the other to afford matter for the maintenance of its temperature ; and that life cannot long be supported except on a diet in which the elements of nutrition and the elements of respiration bear a certain proportion to each other. Now in milk the proper food of infants, the elements of the former are to those of the latter according to the approximate estimate of an English chemist, in the proportion of one to two, while in

arrow root, sago and tapioca they are only one to twenty-six, and even in wheaten flour only as one to seven. If to this we add the absence in these substances of oleaginous matters which the milk contributes to supply the body with fat, (*and which can be eliminated from farinaceous substances only by a conversion of their elements to which the feeble powers of digestion in early life are not equal,*) and the small quantity, and to a certain extent the different kind of salts which they contain, it becomes at once apparent that by such a diet the health, if not the life of the infant must almost inevitably be sacrificed. The body wastes most rapidly; for it is forced from its own tissues to supply the nitrogeneous elements essential to the maintenance of life. and which its food contains in far too scanty proportion Every organ in the body contributes to its general support and life is thus prolonged, if no kind disease curtail it, until each member has furnished all it can spare, and then death takes place from starvation; its approach, indeed, having been slower, but the suffering which preceded it not therefore less than if all food had been withheld.—(*West on Diseases of Children, pages* 438 *and* 439.)

In some instances where children have been fed on an exclusively farinaceous diet, the mucous membrane, even low down in the intestines, has been found covered with a thin coating of starch which presented the characteristic blue color when treated with iodine.—(*West, &c., page* 440.)

The question which now presents itself for solution is how to obviate the dangers and difficulties above developed. Healthy mother's milk is the true and perfect aliment of the infant. It is not now pertinent to discuss the question how cows' milk may be adapted to the wants of the infant, but how we can supplement the defects of deficient nursing, or furnish a sub-

stitute for it. When we pass from the use of breast milk to the cereal grains, which form the almost universal adjuvants and substitutes in infant feeding, we exchange the casein or animal albumen of the milk for the gluten or vegetable albumen of the grain, and the fat and sugar (the animal carbonaceous matter) of the milk for the starch or vegetable carbonaceous element of the grain. The pepsin, or stomach digestion of the infant is found to be quite equal to the transformation of the vegetable albumenoids, while the *salivary and pancreatic digestion are totally inadequate to the transformation of the starch.* This constitutes the great bar to success in artificial feeding, and is the great obstacle to be overcome. Starch is not assimilable either by vegetables or animals *until it is converted into glucose*, which in the former is accomplished through the agency of heat and moisture in the act of germination, and in the latter through the action of the salivary and pancreatic secretions, and in these secretions the infant is largely deficient.

"Amylum after having been thoroughly cooked—without such process no amylum can undergo the influence of saliva—wrapped in a cloth and held in the mouth of an adult will undergo its normal transformation into sugar almost instantaneously. In the mouth of an infant that change may commence very soon, but takes an hour or more for its completion. Sometimes the transformation of amylum into sugar will not take place at all in a baby of a few weeks. The youngest infant in whom Prof. Ritter Von Rittershain of Prague could prove the presence of saliva, by its action on boiled amylum and chemical tests was forty-one days old. According to Prof. Ritter's results,amylum was considered absolutely indigestible in infancy and might have been added to other food for the purpose of modification and dilution only. "According to Korawin the infusion of the pancreas taken from infancy of the first months of life, exhibits

no power to change starch into sugar. The first trace of this fermentative effect becomes perceptible in the second month only, but it increases so rapidly in the third month as to permit a quantative analysis of the new formed sugar being made. It then increases gradually until the end of the first year, when it is developed to its full extent."—*A. Jakobi, Infant Diet, pages* 32 and 33.

"In the early life of man, probably until the beginning of dentition, *infants offer a true dyspepsia for starchy aliments*, caused by the inactivity of one, probably of all, the humors that concur in the digestion of these aliments. I think it very important to rigorously establish this condition of *physiological dyspepsia* in infants, which, perhaps, in the very young, reaches absolutely the degree of aspepsia inasmuch as the tendency not *only of the public*, but also *among the generality of practitioners*, is too favorable to feed infants with starchy matters. In fact the preference given to starchy articles of food by mothers when they wish to add something else to the nutriment offered by the milk, or altogether to wean the infant is notorious, and we find in many countries, at the present day as well as in the past, the common pap, or what is still more dangerous, rice, arrow root, and tapioca, which contain a larger quantity of starch than bread, united with the normal aliment of the sucking child; and, still worse, this is usually done more frequently and with more persistency when the infants do not thrive, and, when they are sick, i. e. when the digestive power is probably more defective than in healthy infants."

"It is very strange indeed, that this tendency to feed infants with starchy matters should continue to subsist in our days after so many writers on infant feeding, (among whom several English, as Routh, West and Eustace Smith stand pre-eminent)

have already hinted at its inconvenience and long after an eminent physician had given warning against it. Who is the medical man who has not read. indeed, Zimmerman's words on the danger that arises from the common use of pap in infancy? Zimmerman says, "I know very well that millions of infants are fed with pap, but I know also that it has killed many hundreds of thousands of them."—*Prospero Sonsino, M. D., Pisa, Practitioner, Sept.* 1872, *page* 155.)

"Arrow root, in fact, is nothing but starch. ith a mixture of arrow root and water children may be fed to death, but they cannot be nourished, and many a child has succumbed to this diet, an unhappy victim of the lamentable error that the highly commended arrow root was of itself a complete nutriment." (*Chemistry of Food, by Prof. Moleschott of Zurich. Translated by Ed. Bonner, M. D., page* 76.)

"Wheat flour, contains much less alkali than mother's milk—less than is requisite for the formation of normal blood—and, finally, a *totally unnecessary labor the conversion of starch flour into sugar, is imposed upon the infantile organism. It is therefore desirable, first of all, to convert the starch flour into the soluble form of sugar and elextrine.* This is easily done by the addition of malt meal to the wheat flour." *Vogel on Diseases of Children. Translated by H. Raphael, M.D.*)

"It is an important question whether in *utilising starchy foods* it may not be advantageous *to help their transformation by allowing the grain to germinate to some extent*, as in the process of malting, *where the starch becomes changed into sugar.*"—*Letheby on Food, page* 158.)

"It appears to me that the great merit of Liebig's preparationconsists in the use of *malt flour as a constituent of the food*, this from the diastace contained in it, exercises, when the fluid

food or soup is properly prepared, a most remarkable influence upon the starch, quickly transforming it into dextrine and sugar, so that in the course of a few minutes, from being thick and sugarless, it becomes comparatively thin and sweet."—(*Dr Hassall, London Lancet, July* 29, 1865.)

"This soup, (Liebig's Food, when ready for use,) according to my own experience, and that of many German physicians *is the best substitute for mothers' milk and has visibly saved the life of many totally atrophied children.*—(*Vogel on Diseases of Children. Translated by H. Raphael, page* 46.)

Dr. Eustace Smith in his "Wasting Diseases of Infants and Children," after mentioning several more common articles of infant diet, says: "When none of these agree, Liebig's Food for Infants, is extremely useful." The same author speaking of "some infants with whom, in spite of all possible precautions, cow's milk causes indigestion and flatulence," says: "such children will often do well upon Liebig's Food, mixed with milk although the milk by itself causes derangement." "One of the best substitutes for the milk of the mother, or a healthy nurse, is Liebig's soup, (food.) *It comes certainly the nearest in its nutritive properties to the breast milk of the mother.*—(*Condie on Diseases of Children, page* 31.)

Dr. Rjelberg has related his experience of Liebig's Food for Infants, as a remedy: Six cases of diarrhea occurred in the children's hospital among the infants from one and a half to two years; five of them had already been treated with medicine without effect. A thin broth made of the "food was given them as their only nourishment and all the medicine discontinued. The motions at once assumed a better appearance. In one case which had no previous treatment, the effect of the *exclusive* use

of Liebig's food was very striking."—(*Journal of Kinder Krankheiten in Practitioner*, 1869.)

But the conversion of starch into glucose is not the only excellence of Liebig's food. It is composed of equal parts of baked wheaten flour and ground malt, with a portion of bi-carb. potassæ. It is worthy of note that the grains selected for its composition are those richest in the elements of nutrition. In wheat and barley albuminous substances are more abundant than in any other of the cereal grains. In the phosphatic salts wheat ranks first and barley third. Wheat and barley contain also potassa, lime, iron and phosphoric acid in *larger proportion* than any other of their class.

So it appears that Liebig's food possesses these advantages above all other foods prepared for the use of infants.

First, (one-half being malt flour and the starch in the other half being transformed into glucose by the action of the malt flour upon it in the process of preparation,) the starchy portion of the food is prepared for assimilation, a process for the performance of which the infant is by nature incompetent.

Second, the grains selected for preparing it are those most abundant in albumenoids for the formation of muscle, and in the salts for the formation of bone and other nonmuscular tissues.

Now it should be borne in mind, that all the vaunted food for infants annually heralded before the profession and the public, are, *all of them*, starchy compounds, without a pretence of an attempt to transform the amylum into a condition to nourish the infant. Some of them as "Imperial Granum" are almost pure starch, which when cooked are far better suited to the Laundry than to the nursery. In fact all that has

been said in the preceding remarks in relation to tapioca, sago, pap and wheaten flour is *fully true*, of the so-called "Infants food," Substitutes for mothers milk," "Prolactia Papoma Biscotine et id omne genus." Their unfitness for the purpose for which they are made, is shown by their ephemeral popularity and by their number and variety. As in medicine, so in this, when a large number of remedies are of reputed value in a disease, it is safe to infer that none of them are to be relied upon.

The principal objection which has been urged against Liebig's food is the difficulty of its preparation. This objection certainly did lie against the process recommended by its author and against many of the directions since proposed. But as I will soon show by actual demonstration, the simplest form of cooking is all that is requisite. This consists in mixing the dry food, properly compounded, with milk or water, (better milk,) and slowly bringing it to a boil with frequent stirring; or heating it until it begins to thicken, then remove it from the fire and stir until it grows thin, and repeat this process two or three times. At the close of the process it will be quite thin and sweet. No food can be cooked in a simpler manner than this. This dissolving of the thick hydrated starch, is itself the evidence of the transformation amylum into glucose. It is not claimed, that by this simple method, *all the starch* is converted, but that its percentage is very greatly diminished, sufficiently so to afford abundant assimilable nutriment to the infant and also to avoid the dangers and inconveniences arising from the presence of indigestible matter in the intestines. The writer believes this fact alone, that the indigestible starch of the flour, is converted by a natural process into digestible glucose, is sufficient reason for prefering this to other foods. And moreover, if after all, failure attends its use, there remains the comforting reflection, *the food was a digestible nutriment.*